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THE MENTOR

THE HONEYBEE

By FRANK C. PELLETT
Associate Editor
American Bee Journal

DEPARTMENT OF
NATURAL HISTORY

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NUMBER 12

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THE LEGEND OF THE HONEYBEE

ONE of the oldest fables in ancient mythology is that which deals with the origin of the Honeybee. It was to Melissa, and her sister Amalthea, the beautiful daughters of the King of Crete, that the god Jupiter, as an infant, was entrusted by his mother, Ops, when Saturn, his father—following his custom of devouring his children at birth—sought to make the usual meal of this, his latest offspring. Melissa hid the baby in a cave and nourished him on goat's milk, and on honey obtained from the wild bees. One account has it that the bees themselves were drawn to the place of concealment by the noise made by his nurses, Melissa and Amalthea, who beat continually on brazen pans in order to keep the sound of the infant's lamentations from the ears of his ravenous father. Thenceforward the little honeybees took charge of Jupiter, and brought him daily rations of honey, until he grew up and became the head and leader of the gods on Mount Olympus.

In gratitude toward his little preservers, Jupiter, it is related, conferred upon them unique advantages under which honeybees have ever since been able to develop and propagate their species. In the words of one historian, Jupiter "granted his nurses, for a reward," that they should be able to beget their young ones and continue their kind with sex predetermined, so that the work of their race should be without waste and highly efficient. He gave them the power to fix the cell that would, inevitably, produce a Queen, to prepare other cells that would, without fail, produce a drone (the male) or the ordinary honeybee.

According to one ancient form of the legend, the beautiful princess Melissa was, herself, changed by Jupiter into a bee; and, thenceforward, the work of collecting honey for the food of man was confided to her descendants.

Apart from the old dim tales of ancient mythology, where there is romance to account for almost everything, all attempts to trace back the art of beekeeping to its origin brings us to the conclusion that it is undoubtedly the oldest craft under the sun. Thousands of years before the Great Pyramid was built, beekeeping must have been an established and traditional occupation of man.

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THE HONEYBEE

By FRANK C. PELLETT

*Author of "Practical Queen Rearing," "Productive Beekeeping," Associate
Editor "American Bee Journal"*

MENTOR GRAVURES

MANIPULATION OF
THE HIVE

QUEEN BEE SUR-
ROUNDED BY A
GROUP OF HER SUB-
JECTS

AN APIARY IN THE
SPRING



MENTOR GRAVURES

SWARM OF BEES
TAKEN FROM
A TREE

L. L. LANGSTROTH

GATHERING
HONEY



AN APIARY IN TENNESSEE



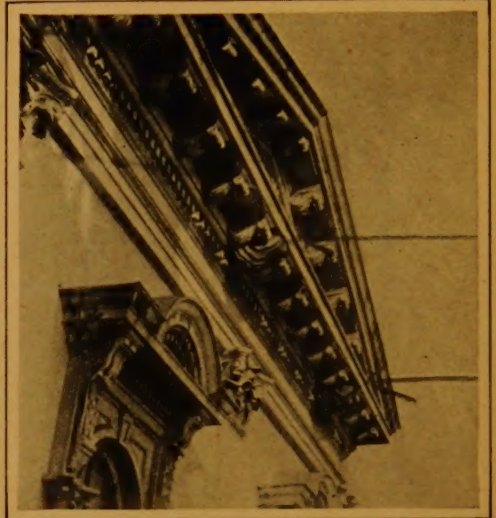
THE honeybee is one of the few living creatures that do not live at the expense of any others. Neither animal nor plant must die that she may live. The nectar that the bee gathers from the flowers and elaborates into honey would otherwise be a waste product and the pollen that she feeds her young is produced in such abundance that her activities only increase the fruitfulness of the plants she visits. The honeybee is probably the most highly specialized of living species of animal life. Living together in harmony, thousands of them work industriously to lay up a common store of honey. No matter how much honey there may be already in the hive, if nectar is to be had in the fields, they work feverishly through the long days to bring it in and add it to their hoard.

If we follow a working bee to her home we shall find there a most interesting habitation. In nature, the bees select some convenient shelter,

THE STORY OF THE HONEYBEE

such as a hollow tree, and there they build the combs in which they rear their young and store their food. Occasionally, when a suitable situation is lacking, they build their combs in the open air. Under the cornice of the court house, at Visalia, California, are two colonies of bees that have been there for several years. In the mild climate of California the lack of extra shelter is not serious and they apparently thrive as well there as in a hive. The wax of which they construct their combs is a product of digestion. When combs are to be built, the bees cluster together in a mass and gorge themselves with honey. On the under side of the abdomen of a worker-bee there are eight wax pockets, four on each side, situated between the segments of the abdomen. When the bees are clustered quietly and fed freely, small scales of wax soon appear in these pockets. The wax scales are manipulated with the mandibles* and modeled into combs as needed. It is only the young bees that are wax workers, the older bees going to the fields for nectar and pollen.

Man early learned to appreciate the product of the bee's labor and to appropriate it to his own use. For centuries bees have been hived in skeps made of straw or in rude boxes and robbed of a part of their honey. In many places it has been the custom to kill the bees in the extra heavy boxes and the light ones, leaving those of medium weight to provide stocks for the following season. Those of light weight were killed because they lacked sufficient honey to carry them through the winter, and the extra heavy ones because they offered a richer store of honey. The medium-weight colonies, with only stores enough to bring them to the following harvest, would supply the swarms to make increase the next year. It is surprising that it took so many centuries to devise means so to utilize the labor of the



HONEYCOMB BUILT IN THE OPEN AIR UNDER THE CORNICE OF COURT HOUSE ROOF AT VISALIA, CALIFORNIA



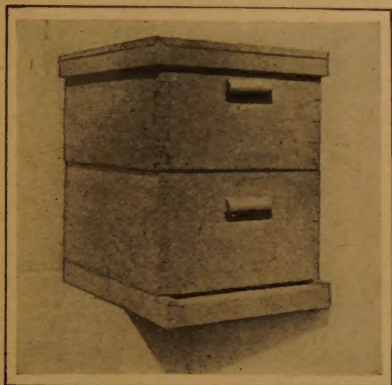
SWARM ISSUING FROM THE HIVE

* The upper or outer pair of jaws of an insect.

THE STORY OF THE HONEYBEE

bees that a sufficient store was left to provide for their needs, while, at the same time, a rich reward went to the beekeeper. Within the remembrance of men now living it was thought to be as necessary to kill the bees to get the honey as to kill animals to get the meat.

It was in 1852 that Rev. L. L. Langstroth conceived the idea of surrounding each comb with a frame that would enable the beekeeper to remove it at any time. It was this invention that made honey production practical as a commercial enterprise. Instead of guessing at conditions within the hive, the beekeeper is now able to make an examination at his pleasure. He can readily determine whether the bees are doing well or whether they need some assistance in the way of food, whether disease is present or any other of the ills to which bees are subject.



A MODERN BEEHIVE

In order to turn their labor to his own account, man has devised a hive which is built for his own convenience rather than for that of the bees

To insure the combs being built straight within the frames, the beekeeper places in each one a full sheet of foundation supported by wires. This foundation is made of pure beeswax impressed with the exact size and shape of the base of the cells by means of a metal roller. The bees

accept this foundation and draw it out into nice combs, just as though they had built them from the beginning. No other material except pure beeswax can be used, for the bees will not or cannot use it. The wax is obtained by melting up old combs that have been previously built by honeybees.

When comb foundation first came into use among the beekeepers, the impression gained wide currency that honey was being manufactured. Well-known writers, who should have known better, made the positive statement that combs were being manufactured of paraffine and filled with glucose and sold as honey. The National Beekeepers' Association offered a reward of \$1,000 and a manufacturer of beehives offered another \$1,000 for any evidence that comb honey ever had been or could be manufactured. Some persons started out confidently to get samples of the manufactured product and claim the reward. No one has ever succeeded in doing so, for the wax combs of the bee cannot be imitated.



SKYSCRAPER HIVES

which, in a good season, produced more than 200 pounds of surplus honey each

THE STORY OF THE HONEYBEE

However, the claim as to manufactured honey persisted until the passage of the pure food laws gave the public confidence in the purity of the product.

Now honey is again coming into its own as an article of food and bids fair to be found in every home, as it was in the days of our grandfathers.



HONEYBEE

QUEEN

DRONE

The Honeybee Family

The colony of bees can well be regarded as one large family. There is the queen whose sole business is motherhood, and there are many thousands of worker-bees who attend to the duties of the household, and perhaps a few dozen drones or male bees loafing around awaiting the time for founding a new community. The father of

the big family always dies on his wedding day and never shares in the labor necessary to support the colony.

It is upon the worker-bees that the labor of the hive depends. When they first emerge from the cells they may be excused for playing a bit, for their period of idleness is very short. Their first duties are all within the hive, nursing the larvae, feeding the queen, or building combs as already mentioned. If we remove a frame from the center of the hive we will find it covered with busy worker-bees. On close examination we find within the cells composing the comb, not only honey, but many of them contain eggs or newly hatched larvae. During the productive period, in summer, the queen lays from one to three thousand or more eggs daily. Each egg is placed at the bottom of an empty cell. At the end of three days the egg hatches and a tiny white larva may be seen. At first it is fed a rich food, called royal jelly, by the nurse bees. This looks like thick milk or white jelly and the young bees are supplied with it so freely that they can be seen literally floating in the rich food at the bottom of the cell. As they grow older the larvae of the worker-bees are



BEES FANNING THE HIVE

Fanning-bees at the entrance making air currents with their wings to ventilate the hive and evaporate the excess moisture from the ripening honey

THE STORY OF THE HONEYBEE

fed a mixture of pollen and honey. It is during this period of its life that the young bee makes all its growth. It changes very rapidly and, in six days after the egg has hatched, the larva stretches out lengthwise in the cell and spins its cocoon. The cell is then sealed over and the larva takes no food nor receives any further attention for twelve days. Thus, in twenty-one days after the egg has been laid, the capping is cut from the cell and a mature bee crawls out, to take her place beside her sisters. At first she is downy and slightly uncertain in her movements, but, in a few hours she appears fully mature in her actions and wise in the ways of the hive.

Cells in which the workers are reared are smaller than those in which drones spend the days of their infancy. Otherwise they are the same.

The period of development is longer for the drone, a total of twenty-five days being necessary for the cycle from the laying of the egg to the emergence of the mature male bee. Since a queen-bee only mates once in a lifetime and drones add nothing to the production of the hive, one of the secrets of successful beekeeping is the elimination of useless drones. It is not enough

to kill them after they have been reared. The rearing of them takes the time and labor of nurses which might be raising worker-bees to add to the production of the colony. Nature is lavish in her expenditures and to make sure that a male will be present when a young queen departs on her mating flight, if left to themselves, the bees will often rear thousands of drones. To avoid this, the



FRAME OF BROOD AND ADHERING BEES TAKEN FROM
A NORMAL COLONY



Photo by Frank C. Pellett, Atlantic, Iowa

BUSY WORKER-BEES WITHIN THE HIVE

THE STORY OF THE HONEYBEE

beekeeper places in his frames sheets of foundation impressed with bases that are all of the size of worker cells. There will always be some drone comb built in corners which insures a sufficient number of drones for the needs of the apiary. The drone is a helpless creature, unable even to feed himself. He remains within the hive except on bright days when he goes abroad to enjoy the sunshine and perchance to meet a young queen. The mating takes place high in the air and the drone, after mating, dies at once.

Organization of the Hive

The beehive is a highly organized community. Although as far as can be seen there is no director, yet no part of the work is allowed to lag. It is a fine example of the ideal community where the toil of all is for the good of all and where the individual counts for naught.

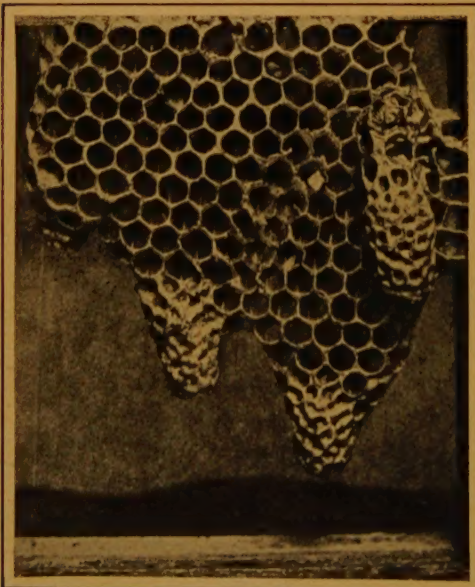
As long as a bee can contribute something to the common end she enjoys her equal share. When she becomes incapable of further labor she receives little consideration and may even be dragged outside the hive to die. In the case of the drone, he is tolerated and encouraged as long as there is likely to be a service that he can render in perpetuating the species, but in autumn, when there is little prospect of more young queens to be mated, he is driven out with little ceremony.

Groups of disconsolate drones huddled together in front of the hives are a common sight in the apiary after the honeyflow is over. Sick or injured individuals are not wanted within the hive, even though they be workers that have contributed a fair share in laying up the store.

During the height of the season, when honey is coming in freely, there are many activities connected with the hive. Bees will be coming from the field laden with nectar, others with pollen and some with water for the young brood. Within the



SWARM OF BEES
Clustered on a branch of an apple tree



PORTION OF A BROOD COMB WITH QUEEN CELLS

THE STORY OF THE HONEYBEE

hive combs will be building, honey will be ripening and the queen will be laying. Some bees will be cleaning the hive, some nursing the young bees and still others will be guarding the entrance, to prevent robbers from entering and carrying off the store. At times during warm weather a group of workers will be standing at the entrance, fanning with their wings to create air currents to ventilate the hive and to carry off the excess moisture from the ripening honey. Just how it is that every duty is promptly performed without an excess of helpers at one task and with too few at another is the secret of the bees. At any rate their organization is so efficient that nothing is neglected, nor is there any lack of harmony as far as the observer can detect.

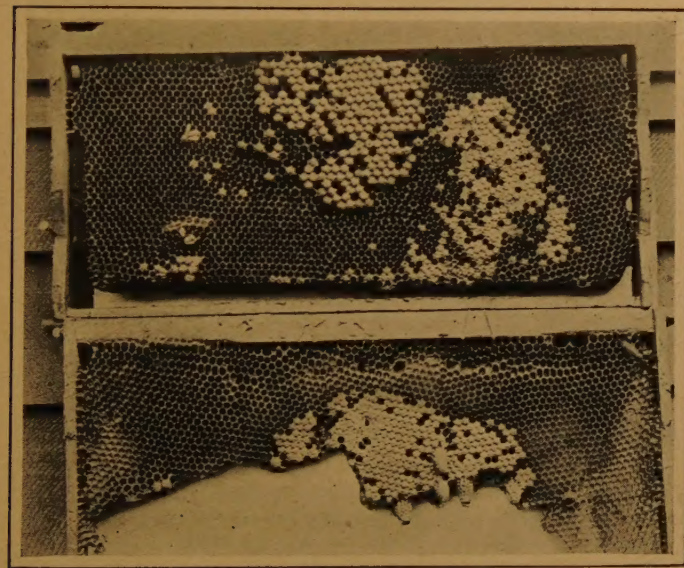
The Waxmoth

Bees are not free from enemies. The waxmoth is a small gray miller which is ever ready to creep into the hive and lay her eggs. The larvae that hatch from her eggs feed upon the combs and stored pollen within the cells. They rapidly burrow tunnels through

the combs, and, in time, entirely destroy the combs, if unchecked. Strong colonies usually defend themselves against the moth, without difficulty, but weak and queenless colonies easily fall a prey to it. Italian bees defend themselves more effectively than do the black or common bees. The presence of moths is usually regarded as evidence of poor beekeeping. The good beekeeper, by keeping all colonies strong, provides the best insurance against this pest.

The Beekeeping Business

Now that proper equipment has made honey production profitable as a commercial enterprise, beekeeping is rapidly develop-



BEE CELLS

The high-arched ones, like bullets, at the top of the upper comb, are drone cells. The low-sealed ones, at the right, are cells of the worker bee. The large cells hanging from edge of the lower comb are Queen cells

ing. The agricultural colleges are teaching the subject, along with other agricultural activities, and the U. S. Department of Agriculture is giving it attention. Beekeeping is a business of many details, and there are a few essentials that must never be overlooked. These have been condensed, by specialists in the United States Department of Agriculture, into the following brief statement: Plenty of reserve stores, added room at the proper time, and suitable protection. This, of course, assumes good stock, proper equipment and prompt attention to details.

Sources of Honey

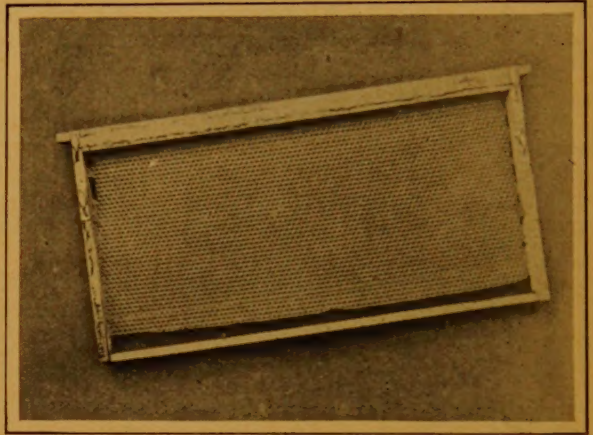
There seems to be a very common impression that bees get honey from all kinds of flowers. This is a mistake, for while many different kinds of flowers produce some nectar, there are many that produce none at all and only a comparatively few, in each locality, that are important as sources of surplus honey.

Another wrong impression is that one can grow a small plot of some

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particular plant in the garden for bees to gather honey from. Bees fly over a large area and it requires thousands of blossoms of a particular kind to make any appreciable difference in the amount of honey brought to the hive. To be important as a source of honey, a plant must be grown in large acreage. It is accordingly necessary for the beekeeper who wishes to engage in honey production, as a business, to locate his apiaries where good honey plants are already present in sufficient abundance to support his apiaries.

There are few places which will not support a few hives of bees. Even near the large cities there is usually sufficient forage to enable the bees to store some surplus and apiaries on the roof, or in the attic, or the back yard, are not uncommon. In the northern states, white clover is the chief source of surplus honey, with sweet clover a close second. The linden or basswood trees are also important. Buckwheat yields honey freely in the vicinity of the Great Lakes and alfalfa is one of the best honey plants in the West. Alsike clover is a good honey plant in the regions where it is grown extensively. The gallberry in the southeast, mesquite in Texas and the sages in California are conspicuous among the wild plants that furnish honey in quantity.

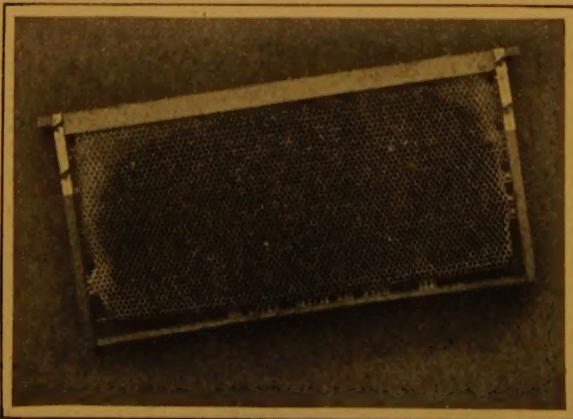


FOUNDATION OF HONEYCOMB

To insure that combs shall be built straight within the frames, sheets of foundation made of pure beeswax are used

The Honeyflow

In most localities the season when honey comes to the hive in quantity is short. There may be several periods during the year when the bees are gathering some nectar, but the quantity may be insufficient to support the bees, leaving them to draw in part on their reserve supply of honey. When honey is coming in freely the beekeeper speaks of it as a "honeyflow." All the activities of the year are centered in bringing



REMOVABLE FRAME

A honeycomb surrounded by a frame which enables the beekeeper to remove it at any time

the bees to this season in the best possible condition to harvest the crop. It is only the strong colonies with thousands of bees that are able to lay up a large quantity over and above their own needs. At this time one strong colony will store more surplus honey than a dozen weaklings. The beekeeper is accordingly watching all the year through to make sure that everything is as favorable as possible to the breeding, freely, in advance of the honeyflow. It requires a skillful beekeeper to get all his colonies up to this point, in condition to make the most of the short time when the harvest is on.

THE STORY OF THE HONEYBEE



BABY BEES WITHIN THE CELLS

There are only a few localities where the amount of forage available is sufficient to support enough bees in one place to provide a livelihood for the beekeeper. He, accordingly, meets the condition by means of a series of outyards. He places as many hives in one location as, in his judgment, can find proper support, and a few miles away he establishes another apiary. Some men have a large number of apiaries with perhaps seventy-five to one hundred colonies of bees in each place. By means of trucks they are able to go from apiary to apiary and give the bees proper attention and move their honey to market. In a poor season when the nectar secretion is light at a particular place, it often becomes necessary to move the bees to another point where honey from some other source is available. With a large truck the beekeeper can move an entire apiary at night and have them ready for the day's work, in the new situation, the following morning.

Bees in Packages

Of late, quite a business has grown up in shipping bees in packages without combs. There is much demand for bees in the Northern States, and beekeepers in the South find it profitable to meet this demand. For the long journey, by express or parcel post, the bees are confined in a cage of wire screen. They are supplied with soft candy on which to feed during the journey. When the buyer receives the bees, he puts them into a new hive, treating them much as he would a swarm that had issued in his own apiary.

Honey for Market

Honey goes to market in two forms: in the comb and in the liquid state, known as extracted honey. Most of the comb honey is in small wood sections holding about one pound. These little boxes are placed in the hives and filled by the bees.

In the days of our grandfathers, liquid honey was called "strained honey," due to the method of removing it from the combs. The only method in those days was to crush the combs and let the honey drain through a cotton cloth. The invention of the extractor made it possible to remove the honey from the combs without spoiling them. This machine is composed of wire baskets, of the proper size to support the frames containing the combs, which revolve on a central shaft inside a metal can. The centrifugal motion throws the honey from the comb against the side of the can. After the honey is thrown from one side of the comb it is reversed and the opposite side emptied in similar manner. By returning the empty combs to the bees, they can be filled again and the bees be saved the



A FRAME OF SEALED HONEY
The finished product of the hive

THE STORY OF THE HONEYBEE

labor of building new ones. It is thus possible for the beekeeper to secure a much larger crop of extracted honey than with comb honey. Although the product called "strained honey" is now seldom seen in the market, many people still cling to the old idea and ask for it.

Great American Beekeepers

Although there are a number of men now living who have contributed greatly to the progress of the industry, there are three names of especial prominence among those that have passed on. Rev. L. L. Langstroth, whose invention of the movable frame hive made commercial beekeeping practical, should be placed at the head of the list.

Moses Quinby was one of the first, if not the first, to make honey production a life work. At the age of eighteen years he earned his first money by working in a sawmill and with it bought his first swarm of bees. At that time beekeeping was considered a matter of luck. As already mentioned, it was the custom to kill the bees to secure the honey. Quinby, desiring to save the bees, took a step forward by boring a hole in the top of the hive and placing an extra box on top for surplus. Follow-



VEIL PROTECTOR

With a veil to protect him from stings and a smoker to subdue the bees, a youthful operator can manage a few colonies

ing the invention of the frame by Langstroth, he at once adopted the principle and designed a hive which, with later modifications by Charles Dadant, has become the standard of several foreign countries under the name of the "Dadant Hive." In 1853 he published his book, "Mysteries of Beekeeping Explained," which had a large sale and which, having been revised by his son-in-law, L. C. Root, is still in print.

Being the first to make beekeeping a source of livelihood, few have had so great influence upon the development of the industry as Moses Quinby. He was born April 16, 1810, and died May 27, 1875, after having spent his life in an effort to elevate beekeeping to the dignity of a business, rather than a fad.

Charles Dadant was born in France, May 22, 1817, coming to America in 1863. Soon after settling at Hamilton, Illinois, where he spent the remaining years of his life, he took up beekeeping seriously. He early became a follower of Quinby and a careful student of bee behavior. He wrote freely for the journals of both Europe and America and his writings were largely responsible for introducing American methods into many



PREPARING BEES FOR SHIPMENT

Shaking bees into a wire cage for shipment by mail or express

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foreign countries. His modified Quinby hive, known as "Dadant Hive," is probably more widely known than any other hive except the original Langstroth hive. It is commonly used in many parts of Europe, Asia and South America. Mr. Dadant was prominent among those that early imported queen bees from Italy and scattered them widely over this country. The introduction of the Italian bees has done much to improve beekeeping in America. He made several trips to Italy in an effort to develop a system of caring for the bees on the long journey, that would make it possible to send them safely.



CHARLES DADANT

Whose writings in foreign journals were largely responsible for the introduction of American methods in Europe. He has long been recognized as a leading authority on beekeeping



MOSES QUINBY

One of the first to engage in beekeeping on a commercial scale. He devoted his life to the development of the business of bee cultivation

He was selected by Mr. Langstroth to revise his book, "The Hive and Honeybee." The revision has been continued by his son, C. P. Dadant, and still enjoys a wide sale in four languages. Charles Dadant died July 16, 1902, after having lived to see his name known as a household word among the beekeepers of the entire world.



A CLASS IN BEEKEEPING AT THE IOWA AGRICULTURAL COLLEGE

SUPPLEMENTARY READING

THE HONEYBEE - - By L. L. Langstroth
Revised by Dadant

FIRST LESSONS IN BEEKEEPING
By C. P. Dadant

QUINBY'S NEW BEEKEEPING By L. C. Root

FIFTY YEARS AMONG THE BEES
By C. C. Miller

PRODUCTIVE BEEKEEPING
By Frank C. Pellett

HONEY MAKERS - - By Margaret Morley

LIFE OF THE BEE By Maurice Maeterlinck

LORE OF THE HONEY BEE
By E. Tickner Edwards

**Information concerning the above books may be had on application to the Editor of The Mentor.

THE OPEN LETTER

One of the pleasures of the years of maturity is to look back and recall certain books that disclosed new worlds to us in the days of our youthful reading. A copy of one of those old books, come upon unexpectedly in a shop or library, opens up a happy vein of reminiscence. Among the book delights of my boyhood was "Langstroth on the Honeybee." I knew nothing of the subject—the book had come to my attention by the merest chance in an out-of-the-way shelf corner. I took it down carelessly, turned its pages in idle curiosity—and then held eagerly to the book until I had finished it. Langstroth made a bee enthusiast of me in one morning. It gave me, therefore, a keen sense of pleasure, to learn, a short time ago, from Mr. Pellett that there was, today, a general demand for the old original edition of Langstroth's interesting work. The very mention of the name of Langstroth brings vivid recollections to me of certain past days of eager, intent reading, followed by investigations and experiments among the beehives. During one summer of my boyhood I spent many eventful hours in pursuing the honeybee; during other hours, quite as eventful, the honeybee was pursuing me. With what a thrill I would respond to the call that the bees of a nearby farm were in swarm, and how proud and important I once felt when I found that the Queen Bee had selected an apple tree in our yard for her place of rest!

★ ★ ★

Brave little, sunshine-loving, honey-seeking bees! Theirs is a life consecrated to industry and thrift. Ever busy and methodical, the honeybees are, by rule of nature, as Shakespeare has said, "endowed to teach the art of order to a peopled kingdom." Work and Save are the two poles of their tiny world—and no promptings of desire or selfish interest enter in to complicate their affairs. No vain social distinctions are known to them, nor are they troubled with disturbing ambitions.

They gather their wealth wherever it may be found, giving fair service in return for the little that they take away. The quality of the flower means nought to them. They pay no special homage to the regal rose nor to any other floral beauties of high degree. They seek only their modest portion of nectar, and are glad to get it anywhere.

"The pedigree of honey does not concern the bee,
"A clover, any time to him, is aristocracy."



"THE LITTLE BUSY BEE"

They do their best all the time, and make the best of things as they find them. A creature that draws sweetness from a poison flower can certainly teach most of us something of industry and optimism.

★ ★ ★

To the youth of many generations the lines of good old Dr. Watts have oft been sung—"How doth the little busy bee improve each shining hour"—and millions of children have been urged to take therefrom a lesson in application and thrift. So far, so good, but a closer study of the social conditions of the bee-hive convinces us that there is something stultifying in the political economy of these little honey seekers. Communism holds the races of bees in thrall, and forbids all individual initiative. No chance is there, in this tight little hive of industry, for an Edison, a Marconi, or an Orville Wright. All labor and production are uniformly standardized. In the thousands that make up the swarm no one is better than another, except the Queen; no one is different from another, except the lazy Drones—and they are soon done away with. While, therefore, we can learn much in thrift from the honeybees, and we do well to pass on their message of industry to children, there are reasons for our not wanting to be "a little busy bee." We respect their steady habits, admire their untiring devotion to labor, and like their honey. But their social order does not satisfy us. The human soul builds its hopes on individual opportunity.

A. S. Moffat
EDITOR



ONEY production as a commercial industry was not practical prior to the invention of the movable frame hive. With each comb enclosed in a separate frame, the beekeeper can remove the frame at will and ascertain the conditions within the hive. The frames hang side by side with only a sufficient space between them to

permit the bees to move freely. Every part of the hive is interchangeable, so that additional room can be added as needed. The bottom board is loose from the hive-body and the cover can be lifted off at will. When the bees need more room a second story or "super" is added. This may be exactly like the first or it may be of a different pattern, suited only to the storage of surplus honey. The frames are supported by means of an extension of the top-bar which rests on a metal rabbet at each end. Thus it is that the beekeeper can remove any or all parts of the hive and examine every corner in search of information as to what is going on there.

By means of his thorough knowledge of the habits of the bees, the beekeeper can do things which seem very wonderful to the uninitiated. Under normal conditions, sentinels are posted at the entrance of the hive to guard against robbers and to prevent annoyance on the part of passing intruders. In order to open the beehive without causing a great uproar, the beekeeper must confuse the organization. With gentle Italian bees it is often possible to open the hive and remove the frames without any special preparation, but with ordinary bees such a procedure would result disastrously to the visitor. By means of a metal implement called a smoker, the beekeeper can control even very cross bees without difficulty. The smoker is a hollow

can with a bellows attached. By burning rotten wood, cotton waste or other convenient material which makes a great deal of smoke, he can stampede the most obstinate defenders of the hive. He approaches quietly from the rear so as not to interfere with the flight of the field bees, and blows a little smoke into the entrance. The sentinels are at once thrown off guard and a general confusion of the inmates follows. They immediately seek the open cells and begin loading their sacs with honey, as though they feared the place was on fire and desired to save as much of their store as possible. The beekeeper next lifts the cover and blows more smoke across the open hive. With a little practice he soon learns just the amount of smoke necessary to subdue the bees without causing undue excitement, and is able to continue his operations with little annoyance.

By thus confusing the bees, it is possible to handle them like so many beans. Public performances are often given where the operator shakes the bees into a pan, dumps the pan of live bees over his bare head and picks them up in handfuls. After they are once thoroughly demoralized there is little danger of stings, except when a bee gets pinched. Although some performers try to give the impression that they possess unusual skill, there is really nothing more in the performance than is practised by any expert beekeeper in controlling his charges in every-day operations.



MANIPULATION OF THE HIVE



THE marvelous organization of the colony of bees has been a source of great interest to naturalists for centuries. There are several different species of insects that are social in their nature, but this characteristic apparently reaches its highest development in the honeybee, where only one queen is permitted to remain. The worker

bees are very solicitous for their queen and she is constantly surrounded by a circle of attendants, that, apparently, anticipate her every need. During the height of the egg laying season a prolific queen will lay from two to three thousand eggs daily. It seems hardly credible that she can deposit two to three times her own weight of rich tissue-forming material every twenty-four hours, yet this is the case. Her digestive processes are assisted by the group of nurse bees that surround her. They eat the coarse pollen, which is the source of tissue-forming material, and complete its digestion for her. During her egg laying, she is fed with great frequency on the regurgitated food already digested by the workers.

The worker bees within the hive are all females, and any one of them might have been a queen had she been reared in a queen cell and fed on the rich food called royal jelly, which is the food of the young queen during the entire period of her larval development.

The difference between a queen and a worker seems to be entirely the result of environment, yet there is a remarkable physical difference. The worker lacks the sexual development of the queen; but she has wax-secreting organs, pollen baskets and brushes which the queen does not have, and a much greater development of eyesight, which permits her to find the distant flowers.

During the summer months, the queen moves almost constantly from one cell to another depositing her eggs. Although

she may live three or four years, she never leaves the hive except on her mating flight and to accompany a swarm. Nowhere else, perhaps, has motherhood become so highly specialized that the mother neither digests her own food, cares for her own person, nor nurses her own offspring. Within the beehive we have a complete example of communism and the most highly specialized animal life.

The instincts of the newly emerged queen are very different from those of either workers or drones. The latter mingle amiably with their fellows without the slightest evidence of hostility, while the young queen will begin a battle to the death with another queen. Occasionally an old and failing queen will remain peaceably within the same hive with a daughter that is to supersede her, but if two vigorous queens are present, one will shortly be destroyed.

If the bees lose their queen through accident or old age, they will immediately build numerous queen-cells and rear several more. The first one to emerge will usually destroy the others. In case the bees are preparing to swarm they will restrain the queen from doing injury to those still in the cells until the swarm is ready to issue.

The queen develops in a much shorter period of time than is necessary with either worker or drone. Only about sixteen days is required for the development of a queen from the time the egg is laid, while twenty-one days is required for the worker and twenty-five days for the drone.

QUEEN BEE SURROUNDED BY A GROUP OF HER SUBJECTS
THE QUEEN IS NEAR THE LOWERRIGHT-CORNER, OPPOSITE THE DOT ON THE MARGIN





WITH the bees, the colony rather than the individual, composes a unit. Since there is only one queen in one hive, no matter how many thousands of individual bees there may be, there is no permanent increase as a result. The swarm is the normal method of increase and, except as the bees swarm, there is no lasting

addition to the species. Swarming can be expected at the season when natural conditions are most favorable to establishing a new community. When the weather is warm and there is an abundance of honey in the fields, the bees can readily build new combs and store a supply of honey against the long winter ahead. When settled warm weather arrives in the spring, and nectar comes freely to the hive, drones are reared and queen-cells built in anticipation of swarming.

When the swarm finally issues, it is the old queen and the old bees that depart, leaving the established home to the young queen and the emerging workers.

The swarming of the bees is an interesting sight, and is always sufficient to arouse excitement among the surrounding population. When the time draws near for the swarm to issue, the queen stops her laying and runs about restlessly. The bees draw a supply of honey from the cells, sufficient to fill their honeysacs to the limit of capacity, and one can often hear the piping and quawking of the queens as the old queen chirps and the young one still within her cell makes a muffled reply.

One moment all is quiet and the next there is a tremendous commotion about the hive. The bees fairly tumble over each other in their efforts to reach the open and take wing. The queen may be among the first to leave or she may delay her departure until near the last. The air will soon be filled with bees, whirling and swaying in large circles, all the time keeping up

such a buzzing and humming that they can be heard for some distance. After dancing about in the sunshine for a time, they will form a cluster on a limb in some convenient place. If the queen alights with the cluster they will shortly be gathered together in a large group quietly resting, but if she remains in the air the bees will be restless and shortly fly away to await her final decision as to a settling place. Without the queen a new swarm would be doomed, as they have no eggs or larvae from which to rear a new one. If the queen is lost in the swarming flight, the bees will shortly return to the old hive.

In the days of our fathers it was thought necessary to raise a great commotion by beating tin pans, ringing bells, pounding kettles or frying pans—anything to make a big noise and settle the bees. Although this custom is centuries old and dies hard, we now know that it has no effect on the settling of the swarm. The clustering of the swarm is as natural as for it to issue from the hive. The exceptional swarm, which leaves without clustering, will leave as readily in spite of the noise.

When the swarm is finally quietly settled on a limb, the beekeeper takes a basket or other convenient receptacle, shakes the bees into it and carries them to their new hive. The picture herewith shows a basketful of bees just shaken down in this manner. There were so many bees that many of them clustered on the beekeeper as well as on the basket.



SWARM OF BEES TAKEN FROM A TREE
THE SWARMING BEES COVER THE BEE-KEEPER AND HIS BASKET

BEESKEEPING as a commercial enterprise is so new, that the public does not yet realize that it is an industry worthy the attention of a red-blooded man of good attainments. In a few localities honey production has been developed to the point where it is a recognized business, but in most places it is regarded as a fad.

In a suitable locality there is probably no agricultural enterprise that offers more liberal returns for the capital and labor invested than bee culture.

California was one of the first states to develop beekeeping on a commercial scale. This is largely due to the fact that J. S. Harbison, one of the early settlers of that state, was a great beekeeper. He startled the entire country by shipping ten carloads of twenty thousand pounds each of comb honey, all the products of his own apiaries, to New York at one time. Naturally, people who were accustomed to thinking of beekeeping in terms of two or three hives in the back yard, and honey in terms of a few pounds, concluded that California offered especially favorable opportunities for honey production. Many that had aspirations for beekeeping on a large scale were induced to go to that state to engage in the business. However, there are many localities as favorable to honey production as any part of the Far West—with the added advantage of being near markets.

The necessity of scattering the apiaries at distances of two or more miles apart presents some problems peculiar to beekeeping. The general use of the automobile has largely overcome the objection to this condition, so that the possibilities of the business are only limited by the skill and capacity of the operator. The writer knows one young man in North Georgia who began beekeeping in a locality which is much below the average in its possibilities, who by means of adapting

his system to his surroundings has been able to build up a business that now brings him a good income. He is only one of many who might be cited, but because of his poor locality and unfavorable conditions he is a striking example.

Many are attracted to beekeeping because of the fact that it is possible to begin in a small way in almost any location and to expand as the beekeeper's resources will permit. There are few lines of opportunity that require such a small outlay to start with. Men who now number their colonies by hundreds have started with a single hive and built up from that. Another attraction lies in the fact that the bees require attention only in nice weather when it is pleasant to be in the open air. In bad weather they are better undisturbed.

No specialized branch of agriculture requires more skill to make it successful than does honey production. It requires a knowledge of habits of the insects and their relation to the production of maximum crops. Unless the operator is prepared to attend to details at the proper time he can never succeed. Hundreds fail because things are not done at the proper time. It is only through a thorough knowledge of the fundamental principles that one comes fully to appreciate the reasons for the various manipulations and to make the most of every opportunity. A member of a Kansas boys' bee club secured more surplus honey from two colonies by following the latest practise, than a neighbor secured under similar conditions from fifty.



AN APIARY IN THE SPRING



ALTHOUGH bees have been kept for their honey for centuries and Virgil wrote a book on beekeeping nearly two thousand years ago, it remained for L. L. Langstroth to devise a frame which would enable the beekeeper to examine the interior of the hive at will. No single invention has had so great an effect on the beekeeping

industry. The fact is that it probably never could have attained the rank of a real industry, justifying a man's entire attention, without the Langstroth invention. Before his day beekeeping was a matter of luck, since, it has become a matter of skill. Many other discoveries have contributed toward the advancement of beekeeping, but no other has been so essential.

Lorenzo Lorain Langstroth has come to be known among beekeepers as "the Father of American Apiculture." He was born in Philadelphia on Christmas day, 1810. As a boy he spent much time in the study of insects, especially ants. His parents were displeased that he should waste so much time and discouraged his study of entomology, (the branch of zoology that treats of insects).

At the age of seventeen Langstroth entered Yale college, graduating in 1831. After spending two years as a teacher of mathematics in Yale, he was ordained a pastor in the Congregational church and spent the next few years in the ministry.

It was not until 1837 that he became especially interested in bees. He bought two colonies of bees in old box hives and began the study of a specialty which was to occupy much of his time for the balance of his days. Little did he dream that it was possible for one man to exercise so much influence on an industry as he was destined to do with his new found hobby. In 1839, having resigned from the ministry on account of impaired health, he removed to Greenfield, Massachusetts. He was gradually increasing the number of his hives, and reading all the books relating to bees that he was able to secure. In 1848 we again find him living in Philadelphia and, with the help of his wife, experimenting with various types of hives in an effort

to find a practical one. These experiments continued until 1851. In that year he devised the movable frame which has revolutionized beekeeping methods nearly all over the world. On October 30th of that year he made the following entry in his diary: "The use of these frames will, I am persuaded, give a new impetus to the easy and profitable management of bees."

The value of the invention was at once recognized by students of bee behavior everywhere, and it quickly came into use among the more advanced beekeepers. Progress was very rapid afterward, since it now became possible to ascertain conditions in any part of the hive, at any time, and discoveries followed in rapid succession. Langstroth, himself, was able to make many interesting observations as a result of his invention. The following year he published his book, "The Hive and Honeybee," which was probably the most important single volume relating to bees ever written. Mr. Langstroth revised the volume for a second edition in 1857 and again in 1859. The book continued to enjoy a good sale without further revision until 1889, when, because of ill health, he selected Charles Dadant to revise it for him. It is rare indeed for a text book to continue before the public for such a long period of time. Since the death of Charles Dadant, further revisions have been made by his son, C. P. Dadant, and it continues in demand till the present.

Mr. Langstroth removed to Oxford, Ohio, in 1858, where he engaged in rearing Italian queen bees for sale. He abandoned extensive beekeeping in 1874 on account of continued ill health, but continued his interest as long as he lived. On October 6, 1895, while preaching at Dayton, Ohio, he was stricken and died in the pulpit, being then nearly eighty-five years of age.



L. L. LANGSTROTH, FAMOUS PIONEER BEE-CULTIVATOR

MANY insects beside bees are attracted to the blossoms in search of nectar. Butterflies flitting about open flowers, sipping the sweet repast, are a familiar sight. Most of these visitors, however, are content to enjoy the sunshine of summer and perish with the coming of the cold weather. By storing up the honey in the hive, the

bees provide a common store of food, and, by clustering together, they are able to provide sufficient warmth to enable them to survive.

There is an impression that bees hibernate. This is a mistake. By forming a cluster they are enabled to generate heat by means of the consumption of food. In extreme weather there is great activity in the center of the cluster, some bees fanning vigorously for the purpose of heat production. There is frequent movement during which bees on the outside change places with those within the cluster. It thus becomes necessary for the bees to store honey, not only for purposes of food, but also to serve as fuel for combustion within their own bodies.

The nectar is very thin when first gathered. To the taste it seems little different from sweetened water. It has been estimated that the bees make ten to fifteen thousand trips to the field to bring in a pound of nectar. Since the nectar contains a large excess of moisture which must be evaporated in elaborating it into honey, it is probable that every pound of sealed honey represents twenty to forty thousand trips to the fields on the part of the bees.

When the nectar is first brought to the hive it is deposited in open cells. Apparently the bees move it from place to place within the hive several times before the process is completed. After darkness falls and the bees can no longer go to the fields, activity within the hive is not diminished. The visitor to the hive at night, during a honeyflow, will hear a constant buzzing and movement which indicates that the bees are caring for the products brought in during the day. During the heat of the day a group of bees will be constantly at the entrance, fanning with their wings to

create air currents to ventilate the hive and carry off the excess moisture from the ripening honey.

It sometimes happens that unwise beekeepers who lack sufficient equipment will extract the new nectar from the combs before it is sufficiently ripened. The writer has seen large numbers of cans of unripe honey which reached the market in a very bad condition. It was fermenting, bursting the cans and running over the floor. It is needless to say that the hasty producer failed to realize a satisfactory profit on the transaction. If left to the care of the bees until properly ripened, honey will keep indefinitely, and should be as good in ten years as on the day it is taken from the hive. Consumers often make the mistake of storing their honey in the wrong place. It should be kept in a dry cupboard or on a shelf in a warm room. If placed in a damp cellar it will sweat and in time will spoil.

The quality of honey varies greatly, depending upon the kind of plant from which the nectar is gathered. Honey from clover is light in color and mild in flavor, while that from buckwheat is very dark in color and strong in flavor. There is a weed common in many places in the South, known as bitterweed. The honey from this plant is so bitter that it can hardly be eaten. It is about as unpalatable and much the same in taste as quinine.

Most honey will granulate when subjected to frequent changes of temperature. Buyers who are unfamiliar with this characteristic sometimes decide that sugar syrup has been palmed off on them for honey. Extracted honey that has granulated is easily restored by heating it for a time. Care must be used not to get it too hot, as the flavor is easily injured by overheating.



The Little Republic



STRANGE little republic, that, for all its logic and gravity, its matured conviction and prudence, still falls victim to so vast and precarious a dream! Who shall tell us, O little people that are so profoundly in earnest, that have fed on the warmth and the light and on nature's purest, the soul of the flowers—who shall tell us what problems you have resolved, but we not yet, what certitudes you have acquired that we still have to conquer? And if you have truly resolved these problems, and acquired these certitudes, by the aid of some blind and primitive impulse and not through the intellect, then to what enigma, more insoluble still, are you not urging us on? Little city abounding in faith and mystery and hope, why do your myriad virgins consent to a task that no human slave has ever accepted? Another spring might be theirs, another summer, were they only a little less wasteful of strength, a little less self-forgetful in their ardor for toil; but at the magnificent moment when the flowers all cry to them, they seem to be stricken with the fatal ecstasy of work; and in less than five weeks they almost all perish, their wings broken, their bodies shrivelled and covered with wounds.

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Why do they thus renounce sleep, the delights of honey and love, and the exquisite leisure enjoyed, for instance, by their winged brother, the butterfly? Why will they not live as he lives? It is not hunger that urges them on. Two or three flowers suffice for their nourishment, and in one hour they will visit two or three hundred, to collect a treasure whose sweetness they never will taste. Why all this toil and distress, and whence comes this mighty assurance? Is it so certain, then, that the new generation whereunto you offer your lives will merit the sacrifice; will be more beautiful, happier, will do something you have not done? Your aim is clear to us, clearer far than our own; you desire to live, as long as the world itself, in those that come after; but what can the aim be of this great aim; what the mission of this existence eternally renewed?

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And yet may it not be that these questions are idle; and we who are putting them to you mere childish dreamers, hedged round with error and doubt? And, indeed; had successive evolutions installed you all-powerful and supremely happy; had you gained the last heights, whence at length you ruled over nature's laws; nay; were you immortal goddesses, we still should be asking you what your desires might be, your ideas of progress; still wondering where you imagined that, at last, you would rest and declare your wishes fulfilled. We are so made that nothing contents us; that we can regard no single thing as having its aim self-contained, as simply existing, with no thought beyond existence. Has there been, to this day, one god out of all the multitude man has conceived, from the vulgarest to the most thoughtful, of whom it has not been required that he shall be active and stirring, that he shall create countless beings and things, and have myriad aims outside himself? And will the time ever come when we shall be resigned for a few hours tranquilly to represent in this world an interesting form of material activity; and then, our few hours over, to assume, without surprise and without regret, that other form which is the unconscious, the unknown, the slumbering, and the eternal?

MAURICE MAETERLINCK.

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